that the poetry of one age necessarily reproduces the thoughts and modes of expression of previous ages.

It thus appears that the method of treatment which undoubtedly was admirably adapted to the study of the Greek and Roman period becomes less and less satisfactory as the present day is approached. The early chapters are, therefore, by far the most interesting. They deal with the effects of Christianity in turning man's thoughts from the things of this world to spiritual matters, and with the revival of the feeling for nature among the German races, who, living in a northern climate, were naturally led to appreciate and value the beauties associated with the coming of summer. But it may be reasonably urged that evidence of later-day developments of the feeling for nature should be sought in science rather than in art, in the interest taken in the study of natural phenomena rather than in the recantation of praises of sunshine, sea, and the nightingale's song.

It is fairly certain that if some readers do not find this book as interesting as they expect, there will be others who will enjoy its perusal more than this review suggests, and we may safely apply to Prof. Biese the Yorkshire quotation, "He did his best and he couldn't do owt else."

OUR BOOK SHELF.

A Handbook of York and District. Prepared for the Seventy-fifth Meeting of the British Association for the Advancement of Science, 1906. Edited by Dr. G. A. Auden. Pp. xvi+365. (York: J. Sampson, 1906.)

THE handbook which has been prepared for the benefit of those attending the forthcoming meeting of the British Association at York will be found to be exceedingly useful. The volume is neatly bound and printed on suitable paper, is of the size now usually adopted by the local committees, and has a most appropriate design on the cover. Undoubtedly most of the members attending the York meeting will take an interest in the relics of the past with which this ancient city abounds. It is natural, therefore, that by far the greater portion of the book should be devoted to a description of the various antiquities from prehistoric to mediæval times. The editor, Dr. Auden, describes the prehistoric remains, Mr. H. M. Platnauer refers to the relics of the Roman and Danish occupations, and other writers continue the story.

The second part of the volume, which is restricted to 100 pages, contains an account of the geology, botany, zoology, and meteorology of York and district, and, as might be expected from the space allotted, this part of the work is much more condensed, and is not so readable as the earlier portion. The Rev. W. Johnson describes the geology of the district in a chapter exceedingly brief, possibly due to the fact that "the geology of York is, in one sense, of the simplest kind." Dr. W. G. Smith, of the Leeds University, gives an interesting general survey of the botanical features of the district. This chapter is particularly appropriate in view of the leading part being played by Dr. Smith and his colleagues in Yorkshire in reference to botanical survey. Lists of flowering plants, algæ, fungi, Hepaticæ, Sphagnaceæ, Musci Veri; mammals, birds, reptiles, amphibians, fishes, beetles, butterflies, moths, and land and fresh-water shells are given by various York workers. In most cases, unfortunately, the exigences of space prevent much more than lists of species, but it can be safely said that this portion of the handbook forms an epitome of the natural history of the district. Mr. J. E. Clark brings the volume to a close by some meteorological notes.

There are three maps sent with the volume, all of which are excellent. It was a happy thought to reproduce Skaife's archæological map of York, and with the help of the Ordnance Survey department a really charming map of the greater part of Yorkshire is produced. The third is obviously principally for the use of the geological section, and is coloured so as to show the glacial lakes, moraines, &c.

T. S.

Bacteria in Relation to Plant Diseases. By Erwin F. Smith. Vol. i. (Washington, D.C.: Carnegie Institute, 1905.) Pp. xii+285.

AN authoritative account of bacterial plant diseases has long been a desideratum, and no investigator more competent than Mr. Erwin Smith, of the U.S. Department of Agriculture, who has himself made important original contributions to the subject, could be found to undertake such a task. The bacterial diseases of plants are, however, only incidentally mentioned in this, the first volume of the work, which is mainly devoted to methods of investigation and to a bibliography of the general literature of bacteriology, exclusive of plant diseases. As a guide to general bacteriological methods we know no better, though, as it is a preliminary to plant bacteriology, methods specially applicable to pathogenic organisms attacking men and animals are necessarily not to be found. Sterilisation, the preparation of culture media, methods of infection, the investigation of chemical products, keeping of records, and equipment of the laboratory are all dealt with very fully, explanatory figures being used liberally. A considerable section is also devoted to an account of photomicrography. The difficult question of the nomenclature and classification of bacteria is critically discussed at considerable length, and forms an excellent summary of the whole subject. At the end of the volume a number of useful formulæ for stains, etc., is collected, and the bibliography, which extends over sixty-four pages, and index complete the work. The volume is excellently illustrated with thirty-one plates and 146 figures in the text. We congratulate Mr. Smith on this, the first, though perhaps the easier, portion of his task, and shall await the appearance of the next volume with considerable interest.

R. T. HEWLETT.

Outlines of Zoology. By Prof. J. A. Thomson. Fourth edition, revised and enlarged. Pp. xix+856. (Edinburgh and London: Young J. Pentland, 1906.) Price 15*s*.

THIS book has very great positive merits and very slight defects. Though it is packed with facts, and can be recommended to students preparing for examinations, yet it is never dull. Prof. Thomson describes animals, not as corpses, but as living creatures with interesting habits that depend largely on their structure. The method leads to expansion, and yet this excellent zoological text-book is a single royal octavo of hardly more than eight hundred pages. Though our author, to use an American term, "enthuses" his readers, he does not waste words over it.

In his general survey in the first chapter he begins with monkeys, as being the animals most like man, and works down to the Protozoa. In the body of the book, reversing the order, he proceeds from the lowest

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to the highest. This is an ingenious compromise between two methods each of which has something to recommend it. The early chapters, that deal with the functions of animals, the modern conception of protoplasm, the elements of structure, reproduction, the evolution of sex, and heredity are particularly good. The chapter on palæontology is, owing to the necessary limitations, far too short for the subject, but a table makes clear the order in which the different classes of animals appeared upon the earth. When we come to the body of the book we notice, as in the opening chapters, the remarkable clearness of the style; and though morphology is in no way neglected, yet some room is always found for the description of the habits of the animals in question. For instance, there are some eight pages devoted to the habits and functions of birds, their modes of flight, their courtship, their nests, moulting, diet, migrations.

One or two minor points may now be mentioned that seem to be open to criticism. Plants and animals, Prof. Thomson says, "represent the divergent branches of a V-shaped tree of life." But plants originated before animals; the nature of their food proves this beyond a doubt. Animals we must look upon as a branch from the primitive vegetable stem. The account of the Hydromedusæ would be much better for an illustration—a figure of a hydroid with the Medusa of the alternating generation or of Tubularia with its Actinula. Such additions would, of course, increase the bulk of the book, but the figure of a frog (p. 560) is superfluous, since everyone knows what a frog is like. Again, the process of natural selection is easily intelligible without Fig. 378.

F. W. H.

Animal Heroes; being the Histories of a Cat, a Dog, a Pigeon, a Lynx, two Wolves, and a Reindeer. By E. T. Seton. Pp. 362; illustrated. (London: Archibald Constable and Co., Ltd., 1906.) Price 6*s*. net.

MR. SETON has always something fresh and interesting to tell his readers, and in the present beautifully illustrated volume breaks new ground in attempting to reveal some aspects of the strenuous side of the lives of animals, both wild and domesticated. Every one of the stories, we are told—although of course amplified and set out with the picturesque surroundings the author knows so well how to portray—is founded on the actual life of some individual bird or quadruped; the biography of the lynx being based on the author's own backwood experiences. Where all is so good, fresh, and entertaining, it seems almost invidious to select one portion of the book for special commendation. To our thinking, however, the almost pathetic story of "Arnaux," the homing-pigeon, is far ahead of the rest in sustained interest; but some may prefer the history of the tame wolf, while to others, again, the narrative of the wild reindeer may appeal more strongly. Alike to young and old the book may be heartily commended as an excellent example of the best style of animal biography.

R. L.

Some Facts about the Weather. By William Marriott. Pp. 32. (London: Edward Stanford, 1906.) Price 6*d*.

THIS pamphlet supplies just the information about meteorological phenomena likely to be useful to the general public. The instruments in use in climatological stations are enumerated, and the determining factors of climate are explained in order. The booklet should be the means of stimulating interest in the scientific study of weather.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Osmotic Pressure.

PROF. KAHLENBERG'S letter published in NATURE on July 5 shows that, as so often happens, the controversy about osmotic pressure is based on a difference in meaning assigned to that term.

We may adopt what now appears to be Prof. Kahlenberg's conception, and regard the osmotic pressure of a solution as a real experimental pressure reached with some actual membrane in certain practical conditions. Such a definition gives us a conception of great interest and importance, especially from a physiological point of view. But unfortunately it has no bearing on the thermodynamic theory of solution—or the allied theories of fusion and evaporation—which apparently Prof. Kahlenberg still wishes to attack by its means, after he has insisted that "the formation of crystals from a solution, or the concentration of a solution by evaporation are not osmotic processes." Of course they are not osmotic processes in Prof. Kahlenberg's sense of the term. But the theory of fusion and evaporation, which, as I pointed out in my letter published on May 31, has been verified experimentally in the case of the depression of the freezing point to an accuracy of nearly one in a thousand, depends on the hypothetical separation of solvent by some ideal and perfect semi-permeable process.

It is such considerations as these that demand the other conception of osmotic pressure, which, suggested no doubt by Pfeffer's experiments on osmosis, has now, in accordance with the usual course of development of the concepts of physical science, come to possess an ideal significance, towards which the actual experimentally measured quantity can but tend as the experimental conditions approach the ideal state postulated in the theoretical definition.

Defining osmotic pressure as the hydrostatic pressure needed to keep a solution in equilibrium with its solvent across an ideally perfect semi-permeable membrane, we obtain a conception, possibly of less chemical and physiological importance, which nevertheless enables us to develop a thermodynamic theory of solution; and this theory has been verified experimentally in cases where we have reason to suppose that the actual conditions approach the ideal.

I have found that this confusion of ideas as to the conception of osmotic pressure has occasioned trouble in other cases. It would be well if a new name could be applied to osmotic pressure when used in one or other of its meanings; but I suppose that each side in the controversy would insist on the rights of possession and customary usage. Hence I would suggest that, at the cost of some complexity of nomenclature, one of the two meanings should be emphasised as "experimental osmotic pressure" and the other as "thermodynamic osmotic pressure."

Prof. Kahlenberg remarks that "in creating the theory of electrolytic dissociation, the actual phenomena of electrolysis have played a minor part," and wishes thus to invalidate my statement that "the theory rests on electrical evidence, and by such evidence it must be tried." I can hardly believe that Prof. Kahlenberg would wish seriously to commit himself to the opinion that the historical train of ideas by which a given hypothesis may have been reached necessarily supplies the only (or even the best) logical basis for its support. We do not always doubt the stability of our houses because it has been necessary or convenient to remove some of the scaffolding used in their construction.

It is true that the abnormally great osmotic pressures and freezing-point depressions of electrolytic solutions originally suggested that the molecules of their solutes were dissociated; but such observations clearly can give no information on the electrical state of the dissociated structures. A valid test for an electric ion must depend on some electrical property, such as motion in an electric field.

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